

REMARKS

In response to the above Office Action, product-by-process claims 2-6 have been cancelled and recast in method format as new claims 11-14 to more accurately claim Applicant's invention. More specifically, new method claim 11 includes, in a method for making polishing abrasive particles for use in a final stage of a fine polishing process, the steps of:

- 1) condensing an alkoxysilane in the presence of an acid catalyst to form an alkoxysilane condensate having an average degree of condensation of from 2 to 8 and
- 2) then hydrolyzing the alkoxysilane condensate in the presence of an ammonia or ammonium salt catalyst to form cocoon-shaped colloidal silica as the abrasive particles.

Support for new claim 11 can be found in former claims 2, 5 and 6 as well as the background section of the specification where it is disclosed that the polishing abrasive particles are for use in the final stage of a fine polishing process. This has been included in the claim to clarify the difference of the invention over So et al. (US 6,432,151) which does not produce particles suitable for use in a final stage of a fine polishing process.

Support for the step of condensing the alkoxysilane to form an alkoxysilane condensate can be found in Example 1, where it states on page 10, lines 21-22 and on page 11, lines 14-17 that a condensate of tetramethoxysilane with an acid catalyst in the form of a tetramethoxysilane tetramer is used and on page 12, lines 9-12, that the tetramer is obtained by condensing tetramethoxysilane with an acid catalyst.

Support for new dependent claims 12-14 can be found in former claims 3, 4 and 7, respectively. Finally, Applicant has included method dependent product claim 15 to round out the scope of protection to which Applicant believes he is entitled.

In the Office Action the Examiner rejected claim 6 under 35 U.S.C. § 112, second paragraph for depending from cancelled claim 1. Now that claim 6 has been cancelled, the rejection is moot.

Claims 2-6 were rejected under 35 U.S.C. § 102(e) for being anticipated by Nakayama '612 or under § 102(a) for being anticipated by Nakayama '045 (Paragraphs 6 and 7). Now that product-by-process claims 2-6 have been cancelled, it is believed the rejections are moot.

Claims 2-3 and 5-6 were also rejected under § 102(b) for being anticipated by or, in the alternative, under § 103(a) for being obvious over Iso Mamoru, JP 11-060232, hereafter JP'232 (Paragraph 9) and for being anticipated by or in the alternative for being obvious over Rodel Nitta Corporation, EP 1 174 483, hereafter EP'483 (Paragraph 11). These two references may disclose cocoon-shaped colloidal silica particles, but now that product-by-process claims 2-3 and 5-6 have been cancelled, it is believed the rejections are moot. It is believed the same is true with respect to the rejections of claims 2-6 for being obvious over JP'232 in view of So et al. (US 6,432,151), hereafter So and Robey, US 2,524,358 (Paragraph 10) or over EP'483 in view of So and Robey (Paragraph 12).

This then leaves the rejection of former method claims 7-10 for being obvious over JP'232 or EP'483 in view of So and Robey (Paragraphs 10 and 12).

A significant feature of Applicant's claimed invention that was not specifically set forth in former claims 7-10 and is now set forth in new method claim 11 is the step of

condensing the alkoxysilane in the presence of an acid catalyst to form an alkoxysilane condensate having an average degree of condensation of from 2 to 8. When an alkoxysilane is condensed in the presence of an acid catalyst, it is possible to obtain a condensate having the claimed degree of condensation. However, when it is carried out in the presence of an alkaline catalyst, a non-uniform reaction proceeds, producing a product (part of which is colloidal silica) having a broad distribution and no condensate having an average degree of condensation of from 2 to 8 is obtained. Applicant found as discussed, for example, on page 4, lines 25-29 of the specification, that when such a condensate was first formed the resulting cocoon-shaped colloidal silica not only exhibited excellent performance as abrasive particles, but also had excellent alkali resistance.

This step has been included in new method claim 11 to clarify the difference of the present invention over JP'232 and EP'483, because this step is not included in the teachings of these references.

JP'232 is the same as Japanese Patent No. 3195569 cited and discussed on page 3, four lines from the bottom to page 4, line 9 of the specification. As noted there, the process produced "cocoon-shaped colloidal silica" suitable for precision polishing, but it was deficient in alkali resistance.

Comparative Example 1 on page 13 of the specification is an experiment that was conducted by Applicant to replicate Example 1 of JP'232 and show the significance of this difference in the claimed process. There are some minor differences in the description of the test conditions between Example 1 of JP'232 and Comparative Example 1 of the present invention, where, for example, in the former, the water concentration is 15wt% and the ammonium concentration is 1wt% and in the latter, the

water concentration is 14.7wt% and the ammonium concentration is 0.93wt%, but such differences are so minor that they are inconsequential. As is apparent from Comparative Example 1 in the specification, the process described in JP'232 results in colloidal silica particles that are inferior in their alkali resistance compared to those produced by the process of the present invention.

More specifically, in Example 1, a "condensate of tetramethoxysilane" was hydrolyzed in the presence of ammonia, whereas in Comparative Example 1 just tetramethoxysilane was hydrolyzed in the presence of essentially the same amount of ammonia. In Example 1, the resultant colloidal silica "did not dissolve" when left standing for a long period of time in an aqueous alkali solution of a pH of 11.5," while in Comparative Example 1, the colloidal silica "dissolved" in the same aqueous solution. Emphasis added. Compare page 12, lines 22-27 with page 14, lines 9-15 of the specification. Moreover, the polishing rate of 0.14 $\mu\text{m}/\text{min}$ of the colloidal silica of Example 1 was better than the polishing rate of 0.09 $\mu\text{m}/\text{min}$ of Comparative Example 1 and the roughness of the polished surface of Example 1 was far superior to that of Comparative Example 1. See page 12, lines 17-22 of the specification.

Example 2 of the present application shows that heating under pressure the resulting cocoon-shaped colloidal silica improved its alkali resistance. See page 13, lines 12-14 of the specification.

The process described in JP'232 hydrolyzes alkoxysilane in the presence of an ammonium catalyst, but it does not teach or suggest the process of the present invention in which the alkoxysilane is first condensed in the presence of an acid catalyst to form a condensate which is then hydrolyzed in the presence of an ammonium catalyst.

While most of the Examiner's rejections are focused on the patentability of the products being produced in view of the product-by-process format of the former claims, it is believed he recognizes this deficiency in JP'232, citing Robey to show that it is known to produce a condensate in the presence of an acid catalyst. Therefore, that it would have been obvious to use an alkoxysilane condensate rather than an alkoxysilane in the process of JP'232, because it has not been shown that this difference imparts a patentable distinction or is an unobvious difference over JP'232.

A process for producing an alkoxysilane condensate in the presence of an acid catalyst may be known by Robey. However, there is no teaching whatsoever in Robey that superior alkali resistance in the resulting cocoon-shaped colloidal silica particles could be obtained if the condensate was used in place of alkoxysilane in the process of JP'232. Compare the results of Example 1 with those of Comparative Example 1 as discussed above. Accordingly, it is submitted that it cannot be said to be obvious to include the claimed condensing step in the process of JP'232 in view of Robey. As noted in M.P.E.P § 716.02(a)II, evidence of a superiority in a property shared with the prior art rebuts a prima facie case of obviousness.

With respect to So, this reference describes growing silica by using silica particles, such as Aerosil (tradename), as seeds. When silica is grown by using silica particles as seeds, a mixture of silica, having large and small particle sizes is obtained, resulting in particles of non-uniform size. These cannot be used in the final stage of a fine polishing process.

The present claims are directed to a method for producing polishing abrasive particles used in a final stage of a fine polishing process, and So does not produce any such particles.

Accordingly, it is not believed that new method claim 11 or claims 12-15 dependent therefrom are obvious over JP'232 in view of Robey and So.

EP'483 describes abrasive particles in which cocoon-shaped colloidal silica and crystalline silica are mixed together. In the reference the production conditions of the colloidal silica are the same as those described in JP'232. In other words, the cocoon-shaped colloidal silica described is identical with the cocoon-shaped colloidal silica described in JP'232, so it also has reduced alkali resistance.

Furthermore, EP'483 apparently improves the alkali resistance by mixing the cocoon-shaped colloidal silica with crystal silica particles (see paragraph 0023 where alkaline compounds are added for pH adjustment), but this makes the particle size of the resulting mixture non-uniform and hence unsuitable for use as fine polishing abrasive particles.

The process of the present invention produces abrasive particles which can be used as polishing abrasive particles in a final stage of a fine polishing process and which have superior alkali resistance by changing the production method of the colloidal silica compared to the prior art as set forth in claim 11.

Even if the step providing the change (i.e., the condensing step) is independently known in the art as shown in Robey, it would not have been obvious to include the change in the process disclosed in EP'483 because the reference apparently tries to achieve the same results (i.e., improved alkali resistance) in a different and unsatisfactory way (i.e., by including crystal silica particles).

Accordingly, it is not believed that new claim 11 or claims 12-15 dependent therefrom are obvious over EP'483 in view of Robey and So either.


It is believed claims 11-15 are now in condition or allowance.

Please grant any extensions of time required to enter this response and charge
any additional required fees to Deposit Account 06-0916.

Respectfully submitted,

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